CLAIMS

We claim:

1. A method for communicating with at least one subscriber, the method comprising:

transmitting orthogonal frequency domain multiplexing (OFDM) signals to the at least one subscriber; and

receiving direct-sequence spread spectrum (DSSS) signals from the at least one subscriber.

2. The method defined in Claim 1 wherein receiving the DSSS signals comprises receiving multiple code division multiple access (CDMA) signals from a plurality of subscribers.

3. A method for communicating with a base station, the method comprising:

receiving orthogonal frequency domain multiplexing (OFDM) signals from the base station; and

transmitting direct-sequence spread spectrum (DSSS) signals to the base station.

4. The method defined in Claim 3 wherein transmitting the DSSS signals comprises transmitting multiple code division multiple access (CDMA) signals from a plurality of subscribers.

5. A system comprising:

a subscriber having

a DSSS transmitter,

an OFDM receiver,

a first antenna coupled to the DSSS transmitter and the OFDM receiver;

a base station communicably coupled with the subscriber, the base station having

a DSSS receiver,

an OFDM transmitter,

a second antenna coupled to the DSSS receiver and the OFDM transmitter.

6. The system defined in Claim 5 further comprising:

a first switch to couple to the DSSS transmitter and the OFDM receiver to the first antenna; and

a second switch to couple to the DSSS receiver and the OFDM transmitter to the second antenna.

7. The system defined in Claim 5 further comprising:

a first frequency duplexer to couple to the DSSS transmitter and the OFDM receiver to the first antenna; and

a second frequency duplexer to couple to the DSSS receiver and the OFDM transmitter to the second antenna.

8. The system defined in Claim 5 wherein the OFDM transmitter comprises:

a plurality of processing paths, wherein each of the processing paths has

a forward error correction (FEC) encoder,

an interleaver coupled to an output of the FEC encoder, and

a modulator coupled to an output of the interleaver; and

an inverse Fast Fourier Transform (IFFT) coupled to receive outputs from modulators in the plurality of processing paths and to output OFDM signals.

9. The system defined in Claim 5 wherein the OFDM receiver comprises:

a Fast Fourier Transform (FFT) unit to perform an FFT on OFDM signals received from the base station;

a plurality of processing paths coupled to individual outputs of the FFT unit, each of the plurality of processing paths having

a demodulator coupled to the one of the individual outputs of the FFT unit,

a deinterleaver coupled to an output of the demodulator, and

a forward error correction (FEC) decoder coupled to an output of the deinterleaver, the output of the FEC decoder being user data.

10. The system defined in Claim 5 wherein the DSSS transmitter and the DSSS receiver comprise a CDMA transmitter and a CDMA receiver, respectively.

11. The system defined in Claim 5 wherein the DSSS transmitter comprises:

a forward error correction (FEC) encoder coupled to receive user data;

an interleaver coupled to an output of the FEC encoder;

a modulator coupled to an output of the interleaver; and

a spreader coupled to an output of the modulator.

12. The system defined in Claim 5 wherein the DSSS receiver comprises:

a plurality of processing paths, each of the processing paths having

a correlator,

a channel estimator coupled to an output of the correlator, the channel estimator having first and second outputs,

a Rake receiver coupled to an output of the correlator and a first output of the channel estimator,

a de-interleaver coupled to an output of the Rake receiver,

a FEC decoder coupled to an output of the de-interleaver,

a FFT unit coupled to a second output of channel estimator.

13. The system defined in Claim 12 wherein the DSSS receiver further comprises a downlink OFDM subcarrier allocator coupled to outputs of FFT units of the plurality of processing paths.

14. The system defined in Claim 5 wherein the base station further comprises a DSSS transmitter and the subscriber comprises a DSSS receiver.

15. The system defined in Claim 14 wherein the DSSS transmitter comprises a CDMA transmitter and the DSSS receiver comprises a CDMA receiver.

16. The system defined in Claim 5 wherein the base station further comprises:

a beacon generator to generate a beacon signal; and

a switch coupled to the beacon generator to combine the beacon signal with OFDM symbols to create a transmission signal for output from the base station.

17. The system defined in Claim 16 wherein the beacon signal comprises at least one spread-spectrum pseudo-noise (PN) sequence.

18. The system defined in Claim 16 wherein the beacon signal comprises a plurality of spread-spectrum pseudo-noise (PN) sequences.

19. The system defined in Claim 18 wherein the subscriber uses a first portion of the plurality of spread-spectrum pseudo-noise (PN) sequences for time synchronization.

20. The system defined in Claim 19 wherein the first portion of PN sequence comprises one PN sequence.

21. The system defined in Claim 19 wherein the subscriber uses a second portion of PN sequences following the first portion of PN sequences for frequency tracking.

22. The system defined in Claim 21 wherein PN sequences in the second portion of PN sequences are shorter than any PN sequences in the first portion of PN sequences.

23. The system defined in Claim 5 wherein the CDMA transmitter is for uplink communications.

24. The system defined in Claim 23 wherein the OFDM transmitter transmits full bandwidth pilot OFDM symbols during downlink for open loop power control.

25. A communication network comprising:

first and second systems, each of the first and second systems including

a DSSS transmitter,

a DSSS receiver, and

an antenna coupled to the DSSS transmitter and DSSS receiver, and further wherein the first system comprises an OFDM transmitter coupled to its antenna and the second system comprises an OFDM receiver coupled to its antenna.

26. The communication network defined in Claim 25 wherein the DSSS transmitter and the DSSS receiver comprise a CDMA transmitter and a CDMA receiver, respectively.

27. The communication network defined in Claim 25 wherein the DSSS transmitter and DSSS receiver in each of the first and second systems are implemented together as a CDMA transceiver and the OFDM transmitter and the OFDM receiver are each included in separate OFDM transceivers.

28. The communication network defined in Claim 25 wherein the OFDM transmitter is for use with downlink transmissions.

29. The communication network defined in Claim 25 wherein the OFDM transmitter and the CDMA transmitter in the second system transmit separate downlink transmissions using downlink multiplexing.

30. The communication network defined in Claim 25 wherein the downlink multiplexing comprises time division duplexing.

31. The communication network defined in Claim 25 wherein the downlink multiplexing comprises frequency division duplexing.

32. The communication network defined in Claim 25 wherein the first system comprises a switch coupling the DSSS transmitter, DSSS receiver and the OFDM transmitter to the antenna.

33. The communication network defined in Claim 25 wherein the first system comprises a duplexer coupling the DSSS transmitter, DSSS receiver and the OFDM transmitter to the antenna.

34. The communication network defined in Claim 25 wherein the second system comprises a switch coupling the DSSS transmitter, DSSS receiver and the OFDM receiver to the antenna.

35. The communication network defined in Claim 25 wherein the second system comprises a duplexer coupling the DSSS transmitter, DSSS receiver and the OFDM receiver to the antenna.

36. The communication network defined in Claim 25 wherein the OFDM transmitter is for downlink transmissions between the first system and the second system and the DSSS transmitter of the second system is for uplink transmissions from the second system to the first system, and further wherein the first and second systems use frequency division duplexing (FDD) to coordinate downlink and uplink transmissions.

37. The communication network defined in Claim 25 wherein the OFDM transmitter is for downlink transmissions between the first system and the second system and the DSSS transmitter of the second system is for uplink transmissions from the second system to the first system, and further wherein the first and second systems use time division duplexing (TDD) to coordinate downlink and uplink transmissions.

38. The communication network defined in Claim 25 further comprising a third system having a DSSS transmitter and an OFDM receiver.

39. The communication method defined in Claim 25 further comprising a fourth system having a DSSS transceiver.

40. The communication method defined in Claim 25 wherein the first system further comprises an OFDM subcarrier allocator coupled to the OFDM transmitter, the OFDM subcarrier allocator to adaptively allocate subcarriers to the second system according to the signal-to-noise (SNR) ratio information of each subcarrier associated with each of the second systems.

41. The communication network defined in Claim 40 wherein the SNR information is measured by the first and second systems and fed back to the OFDM subcarrier allocator.

42. The communication network defined in Claim 40 wherein the SNR information is directly measured at the first system using an uplink DSSS signal of each of the second system.

43. The communication network defined in Claim 40 wherein the DSSS receiver of the first system further comprises a Rake receiver and a channel estimator coupled to provide a channel estimate to the Rake receiver, the channel estimator to send the channel estimate to the OFDM subcarrier allocator for adaptive channel allocation.

44. The communication network defined in Claim 43 wherein the channel estimator uses training sequences to generate the channel estimate.

45. The communication network defined in Claim 43 wherein the channel estimator generates the channel estimate without training sequences.

46. The system defined in Claim 25 wherein the second system further comprises:

a beacon generator to generate a beacon signal; and

a switch coupled to the beacon generator to combine the beacon signal with OFDM symbols to create a transmission signal for output from the second system.

47. The system defined in Claim 46 wherein the beacon signal comprises at least one spread-spectrum pseudo-noise (PN) sequence.

48. The system defined in Claim 46 wherein the beacon signal comprises a plurality of spread-spectrum pseudo-noise (PN) sequences.

49. The system defined in Claim 48 wherein the subscriber uses a first portion of the plurality of spread-spectrum pseudo-noise (PN) sequences for time synchronization.

50. the system defined in Claim 49 wherein the first portion of PN sequence comprises one PN sequence.

51. The system defined in Claim 49 wherein the subscriber uses a second portion of PN sequences following the first portion of PN sequences for frequency tracking.

52. The system defined in Claim 51 wherein PN sequences in the second portion of PN sequences are shorter than any PN sequences in the first portion of PN sequences.

53. The system defined in Claim 25 wherein the CDMA transmitter is for uplink communications.

54. The system defined in Claim 53 wherein the OFDM transmitter transmits full bandwidth pilot OFDM symbols during downlink for open loop power control.